TM- 1456/004/00

AUTHOR
Col. A. Kenneth Swanson

TECHNICAL

RELEASE
S. M. Cooney

for
D. L. Drukey

DATE 11/8/63   PAGE 1 OF 24 PAGES

12/16

TECH MEMO
a working paper

System Development Corporation / 2500 Colorado Ave. / Santa Monica, California

DEVELOPMENT AND MANAGEMENT OF A COMPUTER-CENTERED DATA BASE:

PROCEEDINGS OF THE SYMPOSIUM (10-11 June 1963)*

Part 4: A Computer-Centered Data Base Serving USAF Personnel Managers

Col. A. Kenneth Swanson, USAF

DEC 28 1967

*This symposium was conducted by the Command Systems Department's ARPA Command Research Project, in cooperation with the Advanced Research Projects Agency. This talk, one of the presentations at the symposium, is to be incorporated in a Technical Memorandum containing the complete proceedings.

A-3460 10/62

A COMPUTER-CENTERED DATA BASE SERVING USAF PERSONNEL MANAGERS

A. Kenneth Swanson, Colonel, USAF *

No one of the services could accomplish its personnel management task without the aid of large-scale computers. Yet it is well to recognize that there's an emotional twinge on the part of many military personnel when they associate computers and personnel management. In fact, it's only been a few years since a senior Air Force statesman and former Chief of Staff admonished his incoming Deputy Chief of Staff, Personnel, essentially as follows: "Young man, let me pass on one piece of advice. Don't let those electronic computers ever get involved in the accomplishment of your personnel job."

Well, times have changed. We are convinced that not only can we do a more effective management job, but we can be more personal in the process, through the utilization of this tool. Hopefully, my presentation will dispel some of those lingering fears, particularly on the part of the military; and possibly, as your corporations increase in size, many of the practices that we're initiating in the armed forces will become standard practices in your corporation. With this presentation, I'm concerned with just one area, the use of this computers tool to assist us in the management of a major resource, personnel. I will discuss, basically, our guidelines for system development, and overview of the total process, and the effective use of a data base. I will review where we stand today, and predict where we will be in the 63-65 time frame (since we are testing these developments now and hope to implement them fully on 1 October). Finally, I will discuss our long-range needs and attempt to draw some conclusions are drawn as to the application of a data base to this important area of personnel.

In terms of our guidelines for system development, I would like to touch on three areas: our basic objectives, our goals, and the underlying concepts.

MANAGEMENT OBJECTIVES

- MEET MANPOWER REQUIREMENTS WITH TRAINED PERSONNEL

- MAXIMIZE UTILIZATION OF SKILLS

- IMPROVE CAREER MANAGEMENT

- INTERRELATE PERSONNEL ACTIVITIES

To meet manpower requirements with trained personnel requires a current knowledge of what manpower requirements a mission demands, and also knowledge of status of training of each person in order to utilize his skills effectively. Congressional investigations are often brought about by an ineffective use of skills--an EDP programmer working as a truck driver, for example. A serious and related problem in the military is the need to attract and retain people. Thus, we face the important task of improving our career management capability. And since the personnel effort is just one part of the larger picture, we must consider interchange requirements, with manpower, accounting, materiel and other functions.

SYSTEM GOALS

. IMPROVE PLANNING AND DECISION PROCESS

. SIMPLIFY PROCEDURES

  DEVELOP PRE-TEST AND EVAL TECHNIQUE

. STANDARD DATA ELEMENTS AND CODES

. INTERCHANGE WITH OTHER FUNCTIONAL AREAS

Our system goals are to develop a system responsive to changing mission needs. We do not have a responsive system at the present time. Manpower information is 60 to 90 days old from the time a change occurs in the mission, and our personnel information that we expect our managers to use is 45 to 60 days old. We don't have current information. Further, we must simplify our procedures. We've sort of "grown like Topsy." There are some 400 personnel manuals and regulations in the field and it takes a Philadelphia lawyer to figure out essentially what we want the Airman 3rd class to do when the directive gets down to base level. Another goal, as you would suspect, is the capability to pretest our decisions prior to announcement to the field. Standard data elements and codes are essential to permit the transfer of information between data systems.

OPERATIONAL CONCEPTS

. PERSONNEL CENTER

. EVENT ORIENTATED DATA

  ELIMINATION OF REPORTS

  SIMULATION CAPABILITY

  JUDGMENTAL CRITERIA

. NOT CONSTRAINED BY PRESENT ORGAN OR PROCEDURES

In terms of our operational concepts we have decentralized our operating
functions, and plan to establish a Personnel Center at Randolph Air Force Base,
Texas. Only the planning and policy functions will be retained at Hq USAF in
Washington. All of the operating functions will be accomplished at Randolph.
We are also changing our philosophy of operation. The personnel effort was one
of the first operations to be mechanized, but from that time we've been tied to
a report-oriented system and its resultant time delays. Now we realize, as
has been recognized from the start in the Command and Control System, that we
must turn to an event-oriented basis to obtain a data base that is timely.
This will eliminate reports between echelons. An important operational concept
involves the capability to pre-test our decisions in the force prior to their
announcement to the field. Thus, considerable work is in process in the simu-
lation area. Finally, whereas many objective factors can be provided to the
manager, I feel we must recognize the continuing important judgmental criteria
that enter into the individual personnel decisions. I feel that, in managing
personnel, the factors on which decisions are based should be objective. Some
subjective evaluations will occur--for example, the General may want a certain
officer for an aide--but we will try to provide for handling the requirement
objectively and add judgmental criteria in the final decision process.

Now, let's take a look at the total job. (See Figure 1.) As you go from
Headquarters USAF to the major air commands, put in a multiplier of 20. In
other words there are some 20 major commands, each confronted with personnel
management tasks. Introduce another multiplier of 10 until you proceed down
to some 200 Air Force installations. Thus, you must have a standard system
that serves some 20 major commands and some 200 installations; it must handle
some 650,000 airmen on base level and some 130,000 officers. To this must
be added some 500,000 reservists and the civilian personnel. We must design
a system by which we can manage some million-and-a-half people. Note that
the detail in the active duty record puts in the multiplier of 800,000.

In the management process, there are five standard functions, shown in the
center of Figure 2: planning, directing, controlling, coordinating, and
supervising.

In terms of the functions to be supported and the procedures that must be
covered, there is, in effect, not one system--there are several systems, all
of which must be served.

First, requirements must be established, program documents must be made to
reflect the requirements, a budget must be prepared, and personnel must be
procured, classified, trained, assigned, evaluated, promoted, and finally,
separated. These functions constitute the process of personnel management.
A change in any one function affects most of the others. For example, if an
airman changes his AFSC (Air Force Speciality Code, or skill categorization),
he carries that classification to his new job and also his grade, so the
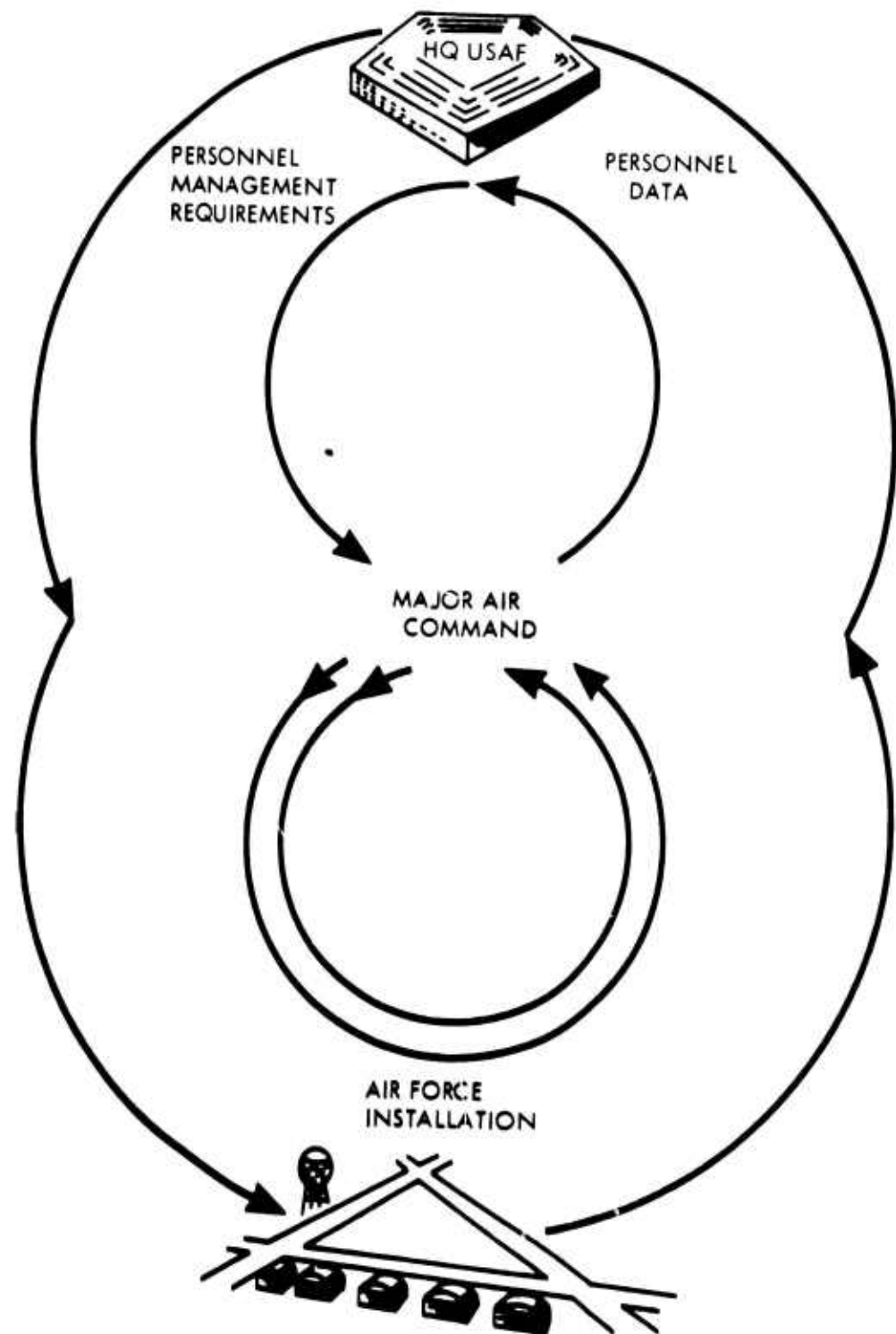requirement for training is decreased by one in the new job and increased by
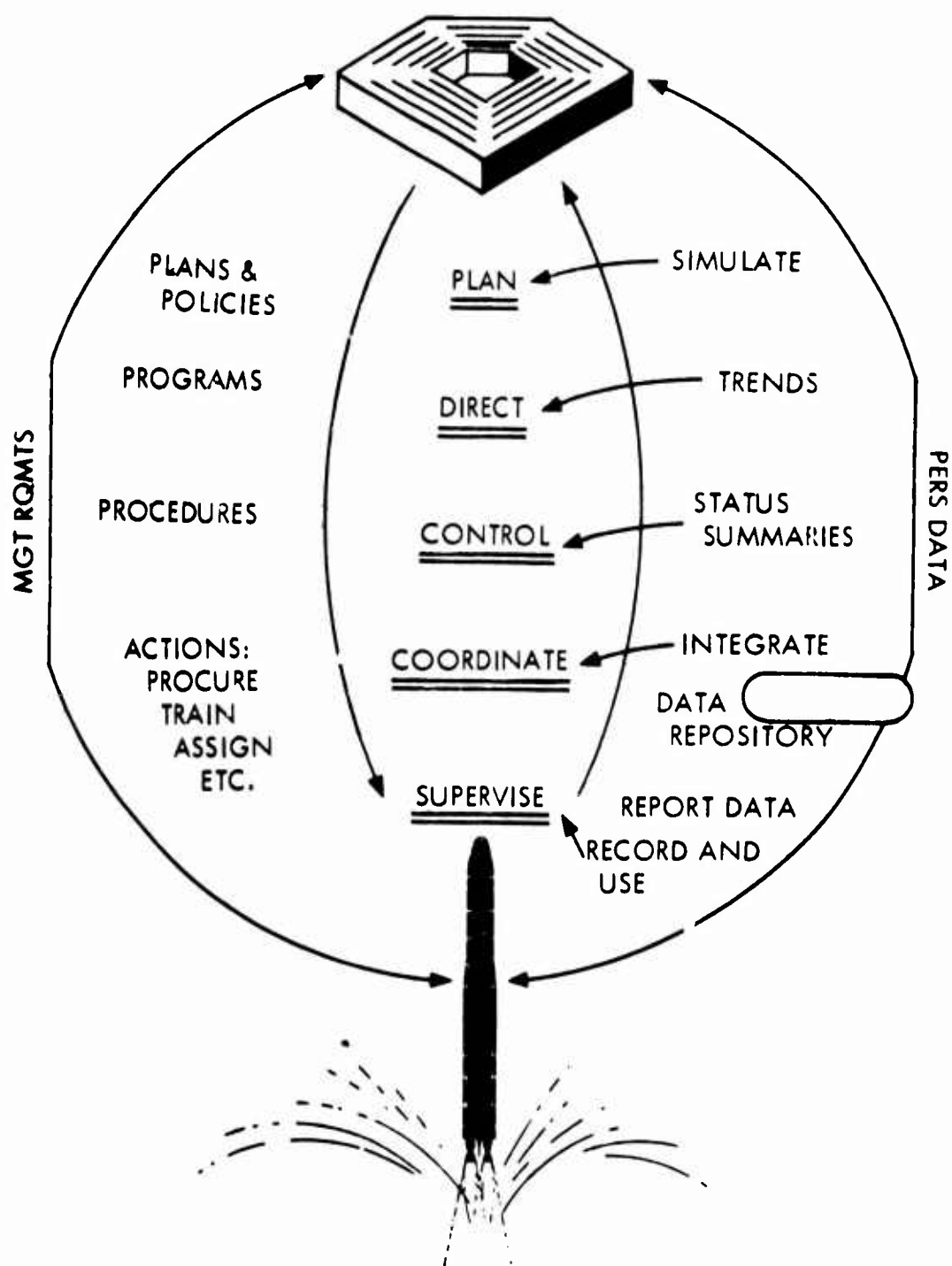
Figure 1. The Total System

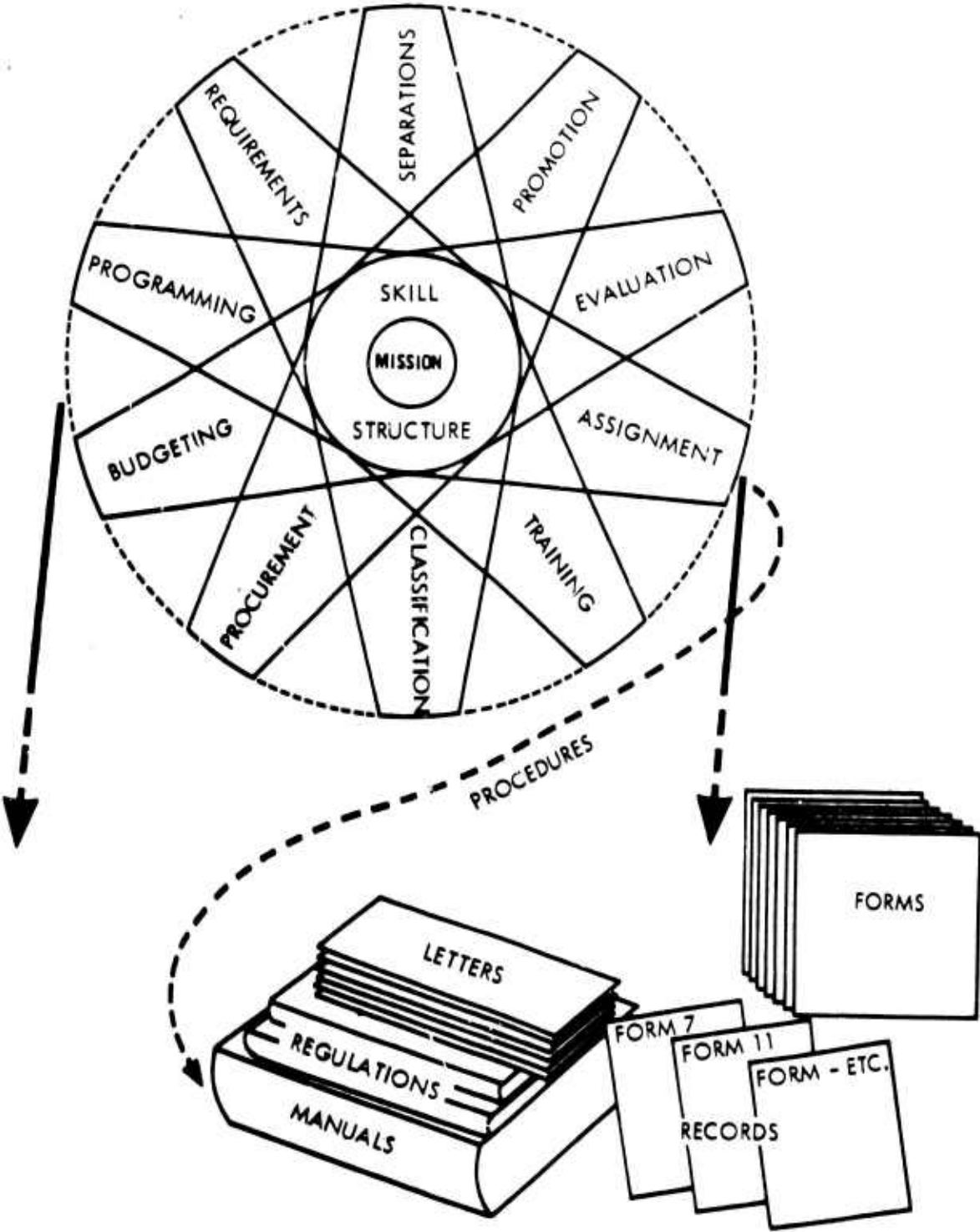Figure 2.   The Management Process

Figure 3.　Management Requirements

one in the field that he has left In fact there is an interaction between each of these functions that must be identified and served. The means by which we convey our requirements to the field is through letters, regulations and forms--some 350 of them.

An important innovation of Mr. McNamara is the ability to relate the skill structure to the mission structure--in other words categorization in program package elements. For example, the category of strategic retaliatory capability might contain a program package element code 102 identifying a B-52 unit. This categorization relates to personnel as well as hardware.

Personnel identified in a skill structure must be related to the mission to be accomplished; this is done as shown in our unit manning documents, which, as an example, may reflect a need for ten people with skill 43151, in grade E-5 (Staff Sergeant). The program package element would be 112, and this is the means of relating skill to the mission; this involves not only hardware, but people.

One of our major projects has been the attempt to simplify our procedures.

In terms of man-to-man communication we have found decision logic tables, (e.g., GE TABSOL) an extremely effective device. (See Figures 5 and 6.) Such a table is a tabular presentation of a decision to be made. It says, for example, that under rule 1, and under these conditions, the action will be so and so. As people generate procedures or requests for actions at base level, we ask them to analyze these procedures in a decision logic table format. The result has been remarkable. For example, in one instance, a regulation was examined and found to be unnecessary; in another instance, five regulations totaling 55 pages were condensed into one of 15 pages, in clear format. Some 250 of our managers in personnel have been trained in the application of this technique and we've found it remarkable in terms of clarifying their thinking of what precisely they want personnel to do.

Now let us discuss the flow from base level up through major air command to Headquarters USAF. (See Figure 7.) The core of this flow is a data base, designed to serve each of these responsibilities. Incidentally, we have a modest degree of mechanization, namely, a so-called document writer, a keypunch and sorter in the base personnel unit, and at each major air command we have a major data processing capability. With the hardware being manufactured by several different companies, standard programming is made more difficult. This data provided on a transaction basis daily serves each of the functional responsibilities involved.

We have broken down our task in what might be a rather unique way. This is exclusively an in-house project thus far.
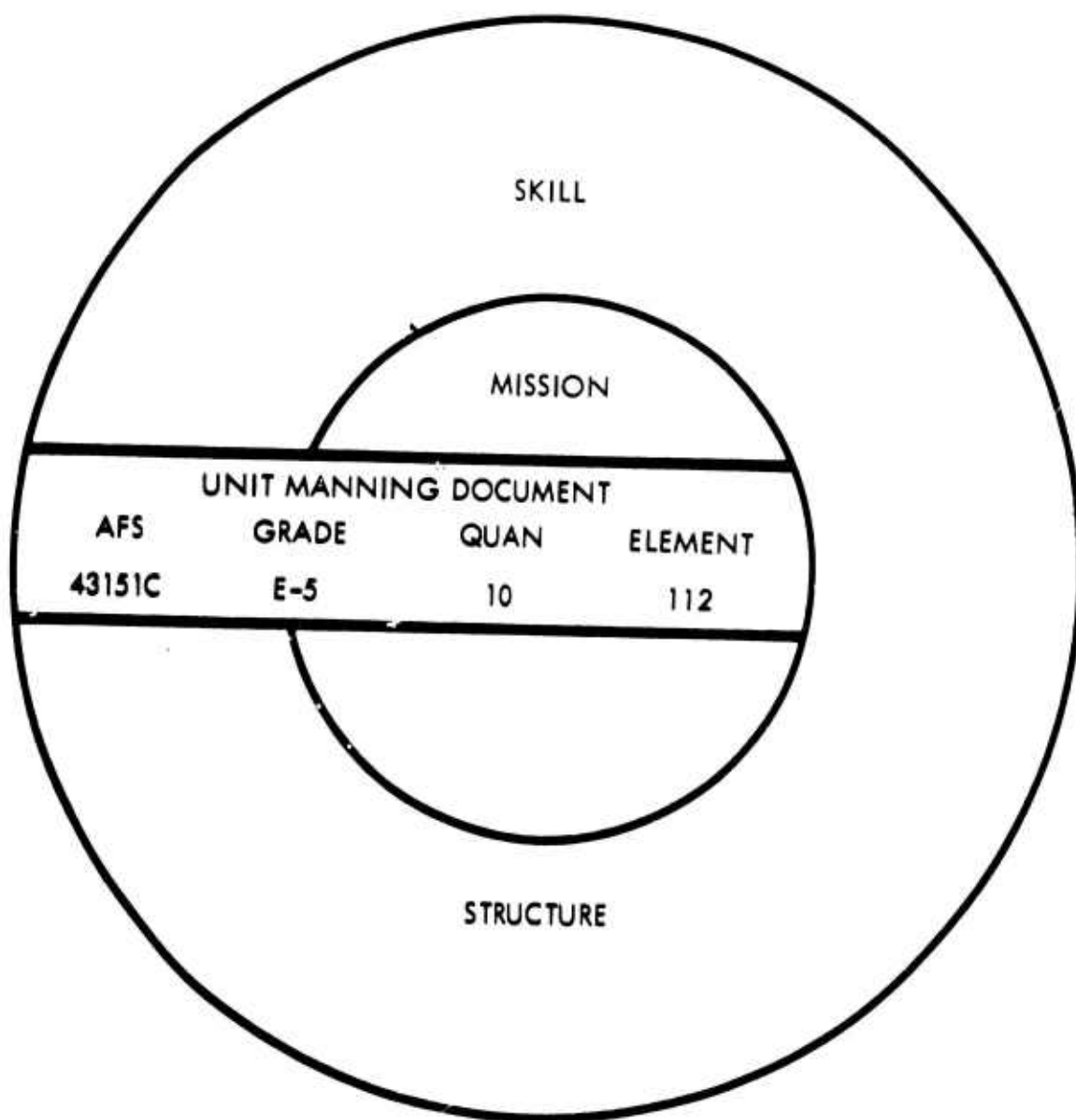
SKILL

MISSION

UNIT MANNING DOCUMENT

AFS	GRADE	QUAN	ELEMENT
43151C	E-5	10	112

STRUCTURE

Figure 4.   The Tie-In--UMD Line Item

Figure 5. Decision Logic Table

(IF) ANIMAL	(AND) NO. OF LEGS =	(AND) NOSE LENGTH IN FEET =	(AND) NECK LENGTH IN FEET =	(THEN) NAME =
YES	4	≥ 3	< 3	ELEPHANT
YES	4	< 3	≥ 3	GIRAFFE
YES	4	≥ 3	≥ 3	FREAK

Figure 6. How to Tell an Elephant From a Giraffe (Without Really Trying)

FACTORS:

GRADE
SKILL
AFSC
LOCATION
NUMBER
EDUCATION
DATES
LENGTH OF SERVICE
TIME IN GRADE
AVAILABILITY
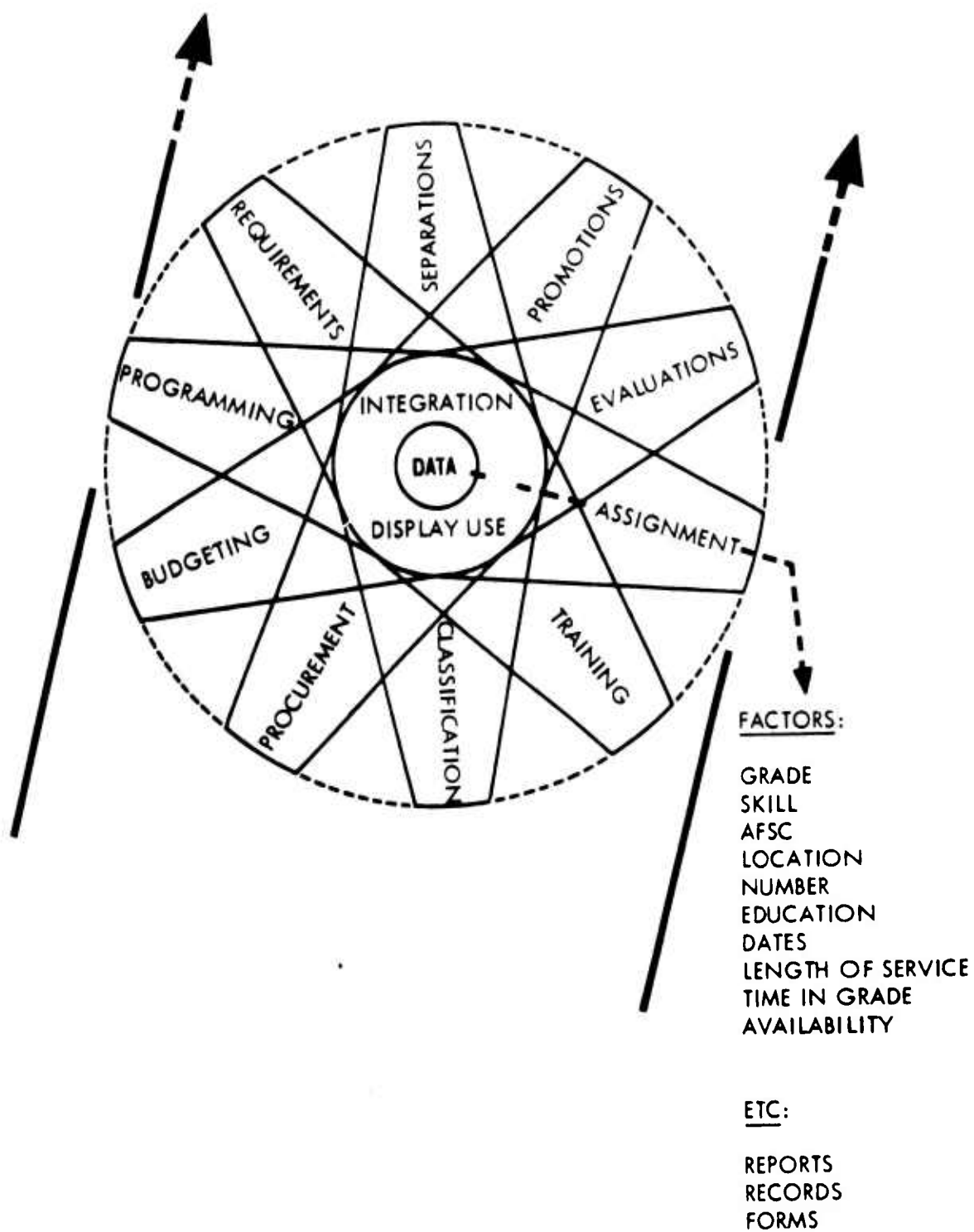
ETC:

REPORTS
RECORDS
FORMS
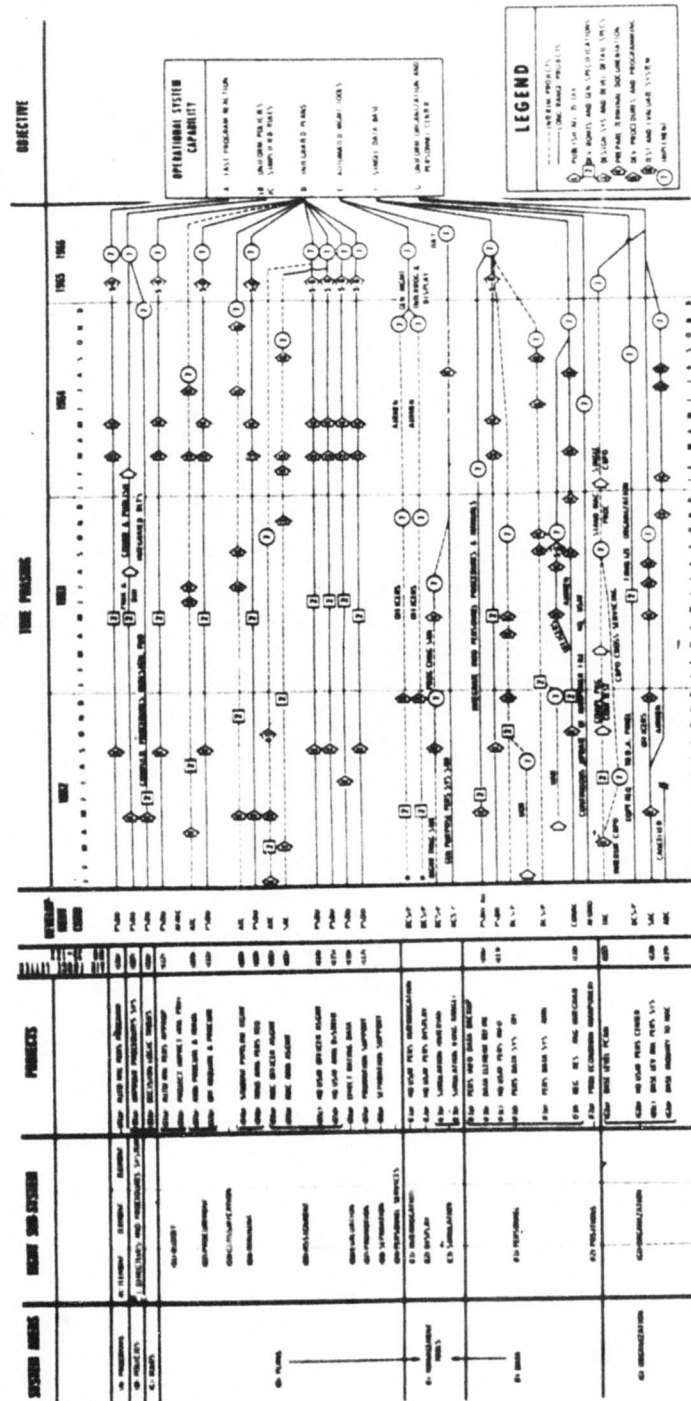
Figure 7. Data Feedback

Figure 8.　Personnel System Master Plan

We divided this total task into a series of projects, effecting a decentrali-
zation of our design effort. (See Figure 8.) For example, we have given SAC
the problem of creating a base-level computer package, now being tested at
Vandenberg, and will seek assistance and concurrence from the rest of the
major air commands within the constraints that are exercised at USAF (in terms
of total system design and data elements) the package will then be used across
the board. In allowing all major commands to participate, we find the system
easy to sell even though there are some serious problems in the coordination
of each of these 20 projects in terms of a single system.

DATA BASE UTILIZATION

. INTERROGATION

. DISPLAY

. SIMULATION

For effective use of this data base, we want to be able to interrogate it in
any detail that we desire, relating the detail to a particular problem. It
is difficult to single out in advance the items that are necessary; further,
the relationship between these items is constantly changing. Each of our
managers should have a tool that will permit him to relate items relevant to
his current problem. As an example of our efforts in helping managers use
this tool, typical interrogation related to the centralized control of USAF
Colonels follows. All decisions on assignments of Colonels are made at
Headquarters USAF.

(REQUEST ELIGIBLE COLONELS FOR WING COMD POSITION)

CRITERIA:

ASSIGNED CONUS
COMMAND PILOT (ON FLYING STATUS)
QUALIFIED AS:
　　　　　　　　　　　　　ORG COMMANDER
　　　　　　OR
　　　　　　　　　　　　　DIRECTOR OPERATIONS
DATE OF RANK: JULY 54 TO JUNE 58
LAST STATION CHANGE: BEFORE DEC 60
RETURNED FROM OVERSEAS: BEFORE JULY 58
EFFECTIVENESS: 8.5 (MINIMUM MEAN)
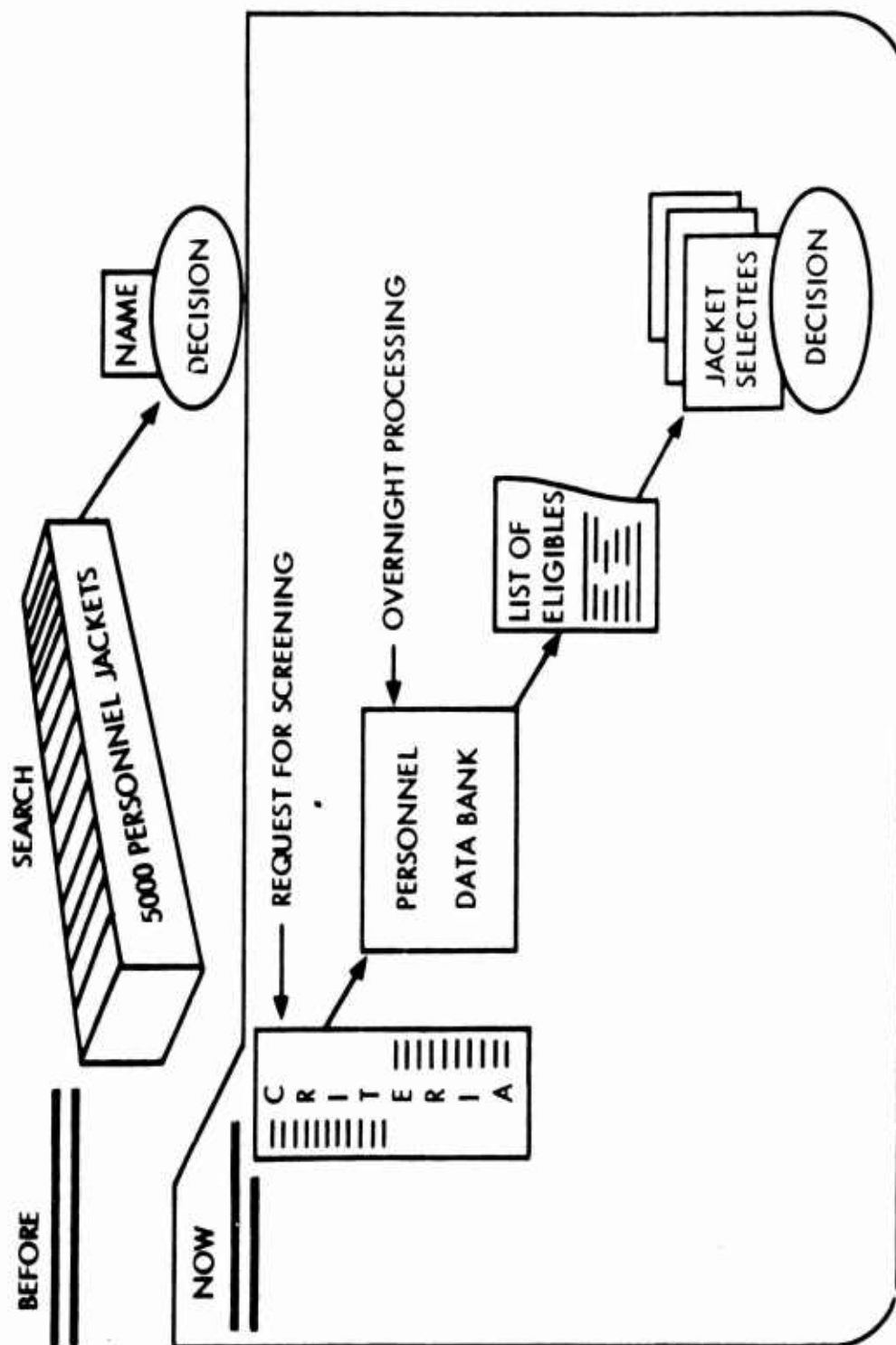
Figure 9. Interrogation

Figure 10. Interrogation

In this case, a Colonel is being sought who is assigned now to the continental United States, is a command pilot, is on flying status, and is qualified as indicated; his rank within specified periods is included, to fit into the heirarchy of the situation to which he's being assigned, and his last station change prior to a given assignment is noted.

This then, is a typical interrogation for filling the requirements of the Colonel's Group.

In the past, such a requirement was filled by what I might call the "method of exhaustion": going through 5,000 files--personnel jackets that we now maintain on our Colonels--and trying to select the individuals whose characteristics met these criteria. Essentially, it became an impossible task and soon a "barbershop" atmosphere resulted, in which selection was based on the personal knowledge of the people in the Colonel's shop--what they remembered, their "sponsor's" comment, etc. Now, the criteria are stated, submitted to data processing, and on the following morning a list of eligibles contains those who meet the criteria. The jackets (or detailed folders) are pulled on the five to eight people, which permits exploration in depth--their effectiveness reports, and any adverse or favorable communications, etc. What does this do? It reduces manual effort, but more important is its positive morale angle-- every Colonel knows that he's considered for every opening for which he can meet the objective criteria. Further, it permits a better job on the few people who meet the criteria, rather than giving a fast pass on everybody in the file.

NAME INQUIRIES

   VARIABLE SELECTOR

   LINEAR PRINT

   CAREER BRIEF

STATISTICAL INQUIRIES

   MANNING DATA

   COMMAND PROFILE

   MATH MATRIX

Figure 11. Inquiry Process as Standard Package

This technique has been used for some time, and a standard package has been developed by one of our major air commands and is being distributed to all major air commands for use in this system. Needless to say, it represents the way in which many air commands have been operating. We are testing now and hope to have it operational by 1 October.

Four types of statistical inquiries are provided to each command. The systems logic is expressed in COBOL terms. Each of these major commands can take the standard file that we've constructed and use these types of inquiries against that file to provide tools for our personnel managers. For example, when commands are trying to meet a levy for a Captain with a certain skill, they know, at a given major command, the relative manning of all their subordinate units when they make this particular selection. A typical command profile gives such information as how many majors and Lt. Colonels within the command are command pilots in category 1 (that is, are active) and have over 2,000 hours in jet time. A math matrix tells the personnel manager, essentially, that given any two elements of data in the record, he can compare these two elements. For example, he might want to compare years of service with grade. Along our Y axis would be years of service, zero to five, and across the X axis would be grade. This, then, is a tool with which the personnel manager can relate items of this type of information.

The next requirement is a capability to isolate specific resources. An operational analogy would provide for limiting the portraying of all aircraft flying over the United States to those within a given section or state, or smaller area and further restricting the display to those over 30,000 feet.

To illustrate, here is a typical requirement placed upon personnel managers for maintenance officers. (See Figure 13.) Across the top is the heading "Primary AFSC," which indicates that this is the area in which the officer or airman has received his training. Along the other axis is the airman's present position. Those people who are indicated by diagonal symbols are being effectively utilized since their duty AFSC and highest training "fit." As you would suspect, there are many reasons for the mismatch of a person's duty AFSC and his highest training--special requirement, needs of the commander, local overages--but we need to be able to identify these people to meet our total requirements. Let us suppose there is a shortage of 60 armament systems officers. The manager must find a source to meet this shortage. If he can display data as shown, he can see that there is an additional resource of 20 officers. Ten of these have received the training that is required but are being used in other than their primary skill. Thus, the assignment officer has the basis for pulling from his file the folders on these men and finding which of them are available for reassignment. Similarly, he follows a series of structured rules, turning first to the area where there are no overages ("authorized" is equal to "assigned") and finally to shortage areas for the skill we are seeking may be more critically short.
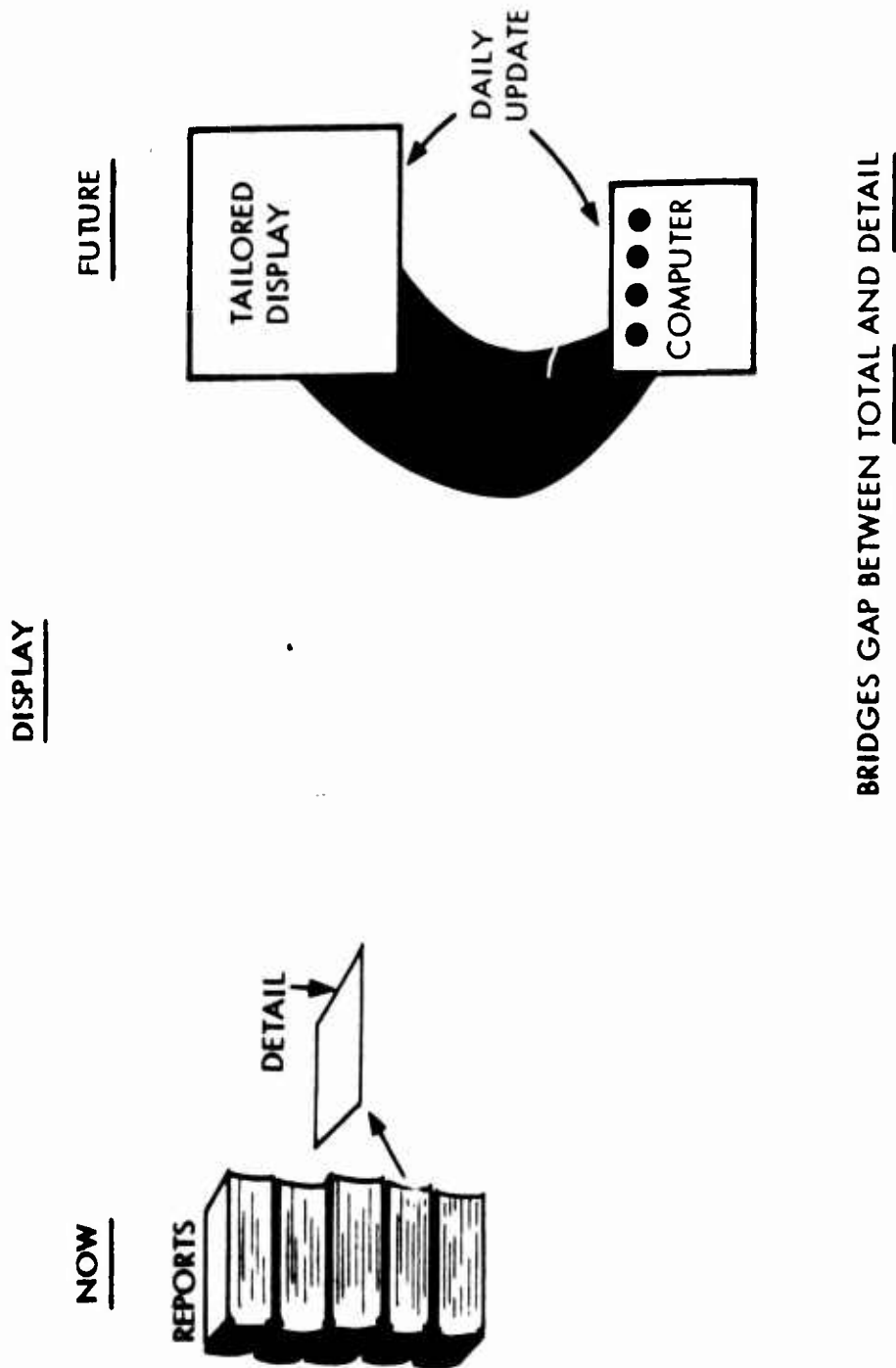
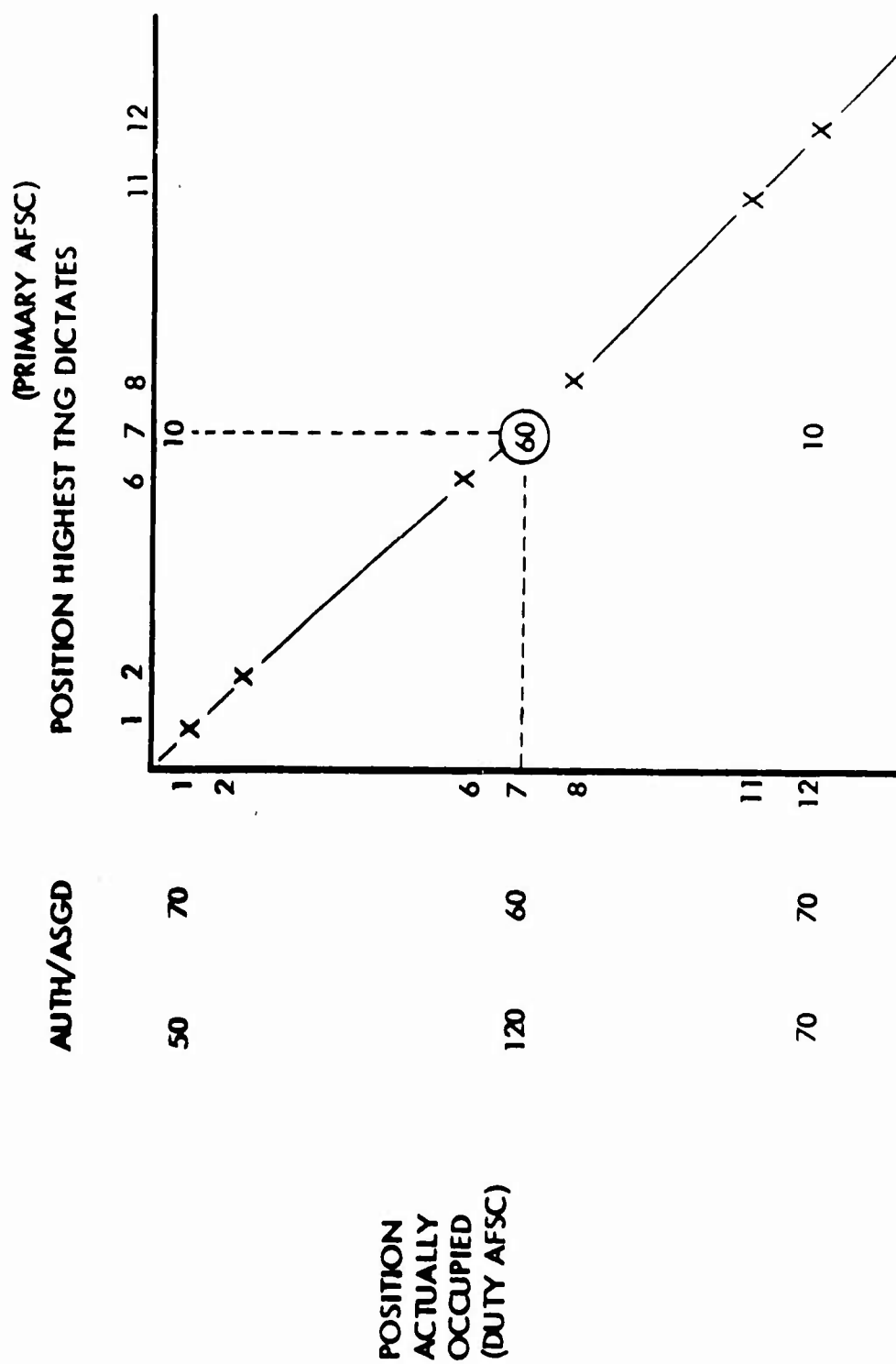Figure 12. Information Technology

Figure 13. Maintenance Officers

SIMULATION

. PERSCOM

. ASSIGNMENT MODEL

. PROGRAM CHANGE

In the area of simulation we have made only a modest beginning in application pertaining to personnel resource management. With a relatively simple game called PERSCOM, played on an LP-30, we tried to show the tradeoffs in procurement costs, training costs, and reassignment costs. It was a useful exercise to point up to our managers the lead times involved and some of the relative costs. Another problem that we examined was that of personnel policies that conflicted. As a result of size and specialization, it is difficult to relate decisions in one area to those in another area. As a partial solution we created a model that, in effect, reflected 23 assignment restrictions, e.g., 18 months on station before the next permanent change of station. With this model we were able to ask the questions: What if the term were changed from 18 months to 12 months? What would be the effect on our officer force in terms of those available for levies for overseas assignment? We have also been engaged, for over a year, in attempting to establish a model of a program change. Here we're concerned, for example, with the impact of dropping two B-47 units from our total force. This is a large-scale model that we hope to have completed within the next several months.

PROGRESS REPORT

. TODAY

. TOMORROW

. DAY AFTER TOMORROW

In terms of these tools, where are we today? We live with one system, we are testing a second, and we are designing a third. We have at present a detailed file of some 51 personnel factors on our officers; in the interim system that we're about to use, we have increased these factors to 102. The present record on officers contains 225 characters, and we plan to increase it to 825 characters. We are increasing the major air command portion from 28 items to 72, and the base from 20 to 55.

	OFF	AMN
CENTER	51-102	0-80
MAC	20- 72	30-72
BASE	20- 55	30-62

Figure 14.　Uniform Officer and Airmen Records (UOR - UAR)

We have not had a detailed file on airmen at Headquarters USAF, and have relied simply on summary reports. We're going to get a detailed central file on them. We're doubling the number of data items on airmen at major air command, with about the same increase at base level. This is necessitated by increasing numbers of requests for detailed information, largely from the Department of Defense.

TODAYS SYSTEM

INTERIM SYSTEM　　　　　1963 - 1965 +

LONG RANGE SYSTEM　　　　TEST IN 1966

Figure 15.　Phases of Development

We have discussed the present and the interim system. The support given by the interim system to major areas, such as the assignment areas, the evaluation area, and the promotion area, will be more effective from this expanded data base than would otherwise be possible. The pressing need, however, is to relate, by means of computer technology, decisions in one area to other areas. That, in effect, is what we're trying to do in a long-range effort. Thus, as the advertisement illustrated, our prime problem is to get a structure that will permit us to interrelate actions from one area to their impact in others.

We, in personnel, are trying to evolve a concept of a data bank to which our managers will have access, thereby freeing them from a report philosophy that they've been living with for the past 20 years. We're concerned with the conversion of these data into information, allowing the manager to take this information and translate it into the decision process. Essentially, we're proceeding in an evolutionary manner, on a project basis, in that we're trying to establish standard Air Force-wide programs. We face many of the problems that others face when a major change is introduced. It's complicated, however,
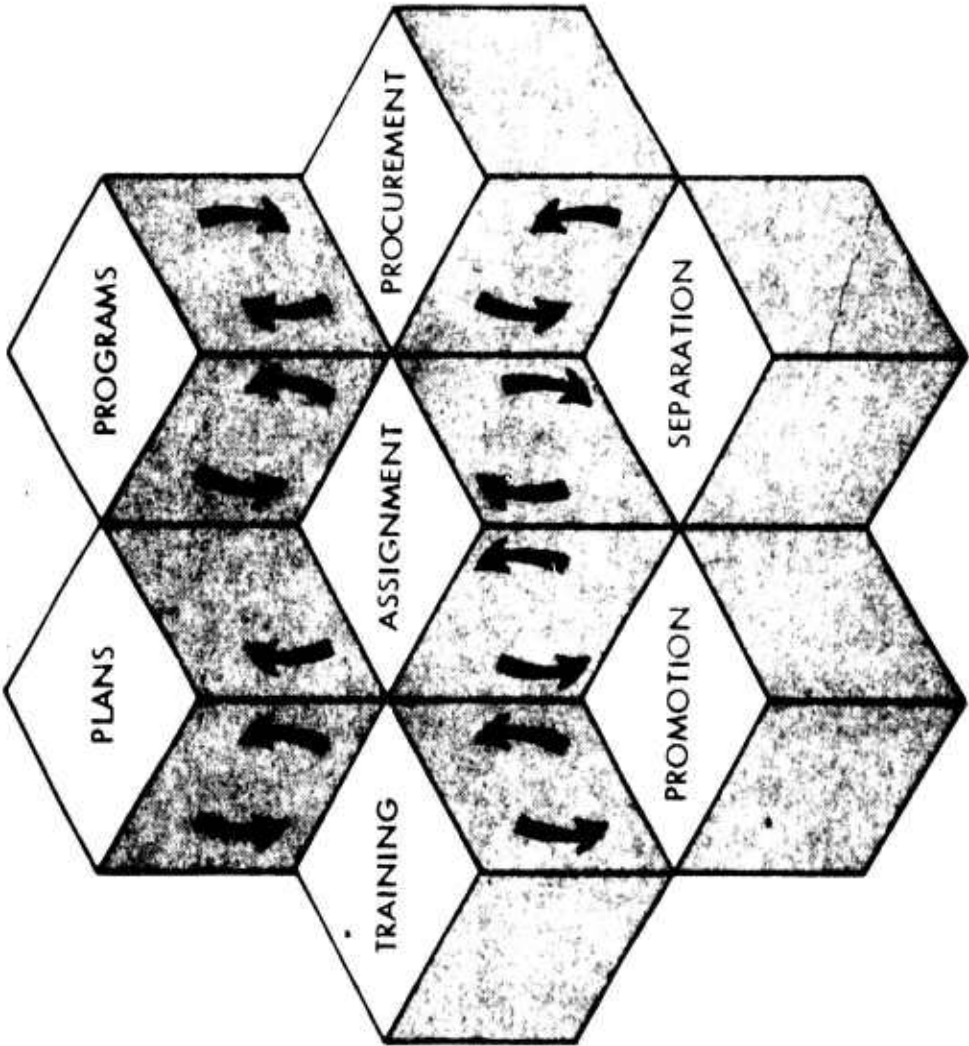
Figure 16. Interrelated Management System

by: (1) the mandatory requirement to use some six different large-scale
computers for the same system; (2) the need to make the changeover all at one
time (we can't live with two different systems, whereas others may in some
cases); (3) the revolutionary change in the manner in which our managers will
do their business; (4) the fact that we encounter an emotional response to
mechanization in this area. Yet, in spite of these things, we face the next
several months with considerable optimism and the firm conviction that we
are serving the individual airman, the officer, and all those charged with
this resource management. All of our efforts are directed toward this end.

Question:

Col Swanson, in discussing your system concept, you mentioned judgmental
criteria. Could you elaborate on the connection here with some of the
important signoffs?

Answer:

I didn't have a chance, in this presentation, to discuss fully the goal our
management wants us to attain. What we are seeking is a man-job-match
capability. I mentioned that we had centralized the decision process on
Colonels at Headquarters USAF. As the demands become more specialized for
the balance of our resource, it is our intent to further centralize the
decision process on Lt. Colonels, Majors and so on. We are seeking a
capability to mechanically match our job requirements (and, incidentally,
the manning document reflects only the skill, the number and the grade;
which is not sufficient). We must carry, with our job requirements, a
series of other job descriptions on the one hand, and a more complete record
on the individual, on the other hand. We must then seek the optimum match
between these two by means of a technique yet to be devised. As for judgmental
criteria, we're going to do the best job that the machine can do and then we're
going to turn it over to the personnel manager to add the subjective evaluation
contained in his effectiveness reports and in other documents. This will be
done before the final decision is made on the assignment area. So, I think
this distinguishes this area from several others. We're going to have to
keep this judgmental criteria in the decision process.

Question

Is it intended that the system will have any impact on the initial processing
or transfer of security clearances?

Answer:

Yes. We have a project that is devoted to that problem; I can't elaborate on
it a great deal more at this time, but we need a technique to simplify the
rather complicated procedure that now exists which delays considerably the
processing of people coming into the service.

Question:

Will you comment on the problems inherent in picking up all that backlog of
doubling the amount of record keeping you're doing?

Answer:

That, of course, is a subject in itself. The key point was that we made the
functional area responsible for the basic input. In the past we had relied
on a service agency for a basic input. So we centralized the function at
base level and then gave these people the smallest tool with which to generate
the basic data, then we provided them with many uses of that data, and through
usage the data are "cleaned up." Secondly, we have produced, at headquarters,
standard programs in COBOL, which we distributed to each of the major air
commands; to date we've been quite lucky. These programs have run on these
various types of computers. Thus far we have tested live data on a Burroughs
220 and we're very optimistic. We made extensive, elaborate audit checks that
we distributed from the Pentagon to each of the major air commands. They must
run each of these programs on the basic data coming in on their computers, so
that we can clean up the data before they are passed from major air commands
to Headquarters USAF. When we get a computer at base level we see, when it
has its own audit and edit capability, the possibility of taking the data
directly from the base to the center without going through the major air
command. That's a long-range goal, but we can't possibly begin to do it until
we clean up the data intercepted at the major air command, through these
extensive programs that we've developed. We are relying heavily on COBOL; it
has reduced the programming work and greatly enhanced the documentation of
our efforts. This alone justifies the use of this standard programming
language. So we're committed to this and at this point we're most optimistic.
Although we have a standard data base, we do permit each major air command to
have a command add-on. In other words, we prescribe a standard number of
data elements--135--but if they find it necessary at SAC, for example, on
certain crew-type data, they have a section in their records to which they
can add and write the programs to process for that major air command.